CENTRAL PIEDMONT
SOIL EROSION AND MOISTURE CONSERVATION EXPERIMENT STATION
Near Statesville, North Carolina

Outline of Soil-agronomic Projects in Operation and
Projects Planned for Installation in 1932 and Later

Project One:

Purpose - To study processes of erosion and to make accurate quantitative measurements of runoff and soil and fertility losses on various soils undergoing various cropping treatments on definite slopes, both with respect to soil (the A horizon) and subsoil (the B horizon). This project includes three separate installations: one on Cecil sandy clay loam, 10 per cent slope (Pl_a), cultivated; one on Cecil sandy clay loam, 10 per cent slope, in virgin timber (Pl_b); and a third on Davidson clay loam of about 10 per cent slope (Pl_c).

Pl_a is on land which has been in cultivation at least long enough for all stumps to have completely disappeared. It includes twelve steel enclosed plots emptying into cement tanks having a capacity to take care of the record 48-hour rainfall for the region. This is located in the Lollar Field (Field M), northeast corner. Ten of the plots are 6 ft. x 72.6 ft.; one is 6 ft. x 36.3 ft.; and one is 6 ft. x 145.2 ft. Three of the 6 x 72.6 plots have been desurfaced down to the B horizon, or subsoil proper, for the purpose of simulating an eroded condition. One of the desurfaced plots is being used for cotton continuously, without fertilizer; while the two others are being used alternately for cotton and corn, using fertilizer. These two plots are to be used to measure the possibilities of restoring soil productivity on land which has lost its topsoil, by the employment of good farm practice, cowpeas being interplanted with the corn crop and Abruzzi rye and vetch following cotton as a winter-cover crop. (These desurfaced corn and cotton rotation plots really constitute a part of Project Three.)

All the other plots have the soil intact, or as much of it as was left after a period of cultivation, i. e., about 6 inches. Three of these (one of normal length, one of short length and one long plot) are devoted to continuous cotton. The three lengths are for the purpose of determining the relation of length of slope to erosion and runoff.

While the treatment employed on these plots will follow as closely as practicable the regional farm practices, the main purpose of these experiments is to study erosional processes and rates.

Pl_b is on virgin Cecil sandy clay loam, covered with oak, hickory, dogwood and forest pine. Two plots, 6 ft. x 72.6 ft., with metal guards to keep out outside water, are included in this installation. Both plots empty into metal tanks. One plot is to be burned annually and the other is to be left as Nature established it. The purpose of this subproject is to determine the relation of forest-litter and forest-mold mulches to runoff and erosion. This plot is situated in the woods northwest of Control Plots (Pl_a).

Pl_c is on Davidson clay loam in Field E. This will include one plot 6 ft. x 72.6 ft., with metal guards to prevent intake of outside water. This will empty into a metal tank. It will be devoted to continuous cotton. The purpose of this subproject is to determine the rate of erosion and runoff on the Davidson soil, which is a less erosive (probably more porous) soil than the corresponding Cecil type.

Project Two:

The purpose of this project is to determine the practical possibilities of crop rotations, legumes and grasses in connection with soil conservation on the Cecil sandy clay loam and Cecil clay loam. The plots used are all of 1/40 acre size (12 ft. x 90.1 ft.).

$P2_a$ includes 20 plots, in duplicate, started in 1931. These are located in Field M, immediately south of the Control Plots (Pl_a). The soil is mostly Cecil sandy clay loam and the slope is approximately 10 per cent. In detail the cropping systems employed on these are as follows:

	Fertilization	Variety
Plot 1 - Cotton (check)	15 lbs. 10-5-3	Mex. B. Boll 5814
(2-year rotation)		
Plot 2 - Corn	10 " 10-5-3	Weekly's
Plot 3 - Cotton	15 " 10-5-3	Mex. B. Boll 5814
(2-year rotation)		
Plot 4 - Corn and cowpeas	10 " 10-5-3	Weekly's, Croit
Plot 5 - Cotton, rye with vetch during winter	15 " 10-5-3	Mex. B. Boll 5814
(2-year rotation)		
Plot 6 - Corn and soybeans	10 " 10-5-3	Weekly's, Laredo
Plot 7 - Cotton, rye with vetch during winter	15 " 10-5-3	Mex. B. Boll 5814
Plot 8 - Permanent Sod	10 " 10-2-4	Mixture [a]

(3-year rotation)			
Plot 9 - Corn and soybeans, rye and vetch during winter	10 lbs.	10-5-3	Weekly's, Laredo, Abruzzi
Plot 10 - Cotton and barley with lespedeza	15 "	10-5-3	Mex. B. Boll 5814
Plot 11 - Lespedeza	10 "	10-2-4	Common
Plot 12 - Cotton (check)	15 "	10-5-3	Mex. B. Boll 5814
(4-year rotations)			
Plot 13 - Corn and soybeans, rye and vetch during winter	10 "	10-5-3	Weekly's, Laredo, Abruzzi
Plot 14 - Cotton and barley with sweet clover	15 "	10-5-3	Mex. B. Boll 5814
Plot 15 - Sweet clover [b]	10 "	10-2-4	White
Plot 16 - Sweet clover [b]	10 "	10-2-4	White
(4-year rotation)			
Plot 17 - Corn and soybeans, rye and vetch during winter	10 "	10-5-3	Weekly's Laredo
Plot 18 - Cotton and barley with sweet clover	10 "	10-5-3	Mex. B. Boll 5814
Plot 19 - Sweet Clover	10 "	10-2-4	White
Plot 20 - Sweet Clover	10 "	10-2-4	White

a. lespedeza, orchard, Dallas grass, white Dutch clover and red-top
b. to be cut for hay

$P2_b$ (for 1932) is to include 22 plots to cover the following checks and rotations (8 to be south of $P2_a$ and 8 plots below $P3_a$; other 4 to be located):

Plot 1 - Continuous Cotton

(2-year rotation)
Plot 2 - Spring oats and lespedeza
Plot 3 - Cotton

Plot 4 - Continuous cotton
Plot 5 - Continuous corn

(2-year rotation)
Plot 6 - Corn
Plot 7 - Wheat and lespedeza

(3-year rotation)
Plot 8 - Wheat and lespedeza
Plot 9 - Lespedeza
Plot 10 - Corn

Plot 11 - Continuous corn

(3-year rotation)
Plot 12 - Wheat and sweet clover
Plot 13 - Sweet clover
Plot 14 - Corn

(3-year rotation)
Plot 15 - Wheat and red clover
Plot 16 - Red clover
Plot 17 - Corn

Plot 18 - Continuous corn interplanted with soybeans
Plot 19 - Continuous corn interplanted with cowpeas

(2-year rotation)
Plot 20 - Spring oats (cut for hay) followed by soybeans
Plot 21 - Cotton

Plot 22 - Kobe lespedeza across slope in rows 18 inches apart, to be cultivated.

The rotations above, being to a considerable extent on rather severely eroded land, will necessarily partake of the nature of the renewal experiments described under Project Three.

$P2_c$ - This project includes the rotations to be practiced on the terraced areas. It is hoped that these rotations can be worked out during the next conference of the officials of the State Experiment Station and the staff of the Statesville Soil Erosion Experiment Station, which should be in time for any fall seeding that may be deemed advisable. Experience at the other stations indicates that with the same rotation used on all terraced fields comparisons of the effectiveness of terracing with different types of terraces can be more advantageously made than where different rotations are used. (In connection with planning the best rotation for the terraced fields, attention should be given the fact that lespedeza thus far has been seriously affected with dodder).

Project Three:

The purpose of this project is to study the possibilities of the renewal of productivity on eroded land.

$P3_a$ relates to the renewal of a badly eroded slope in the south-central part of Field M, which is too steep for cultivation. This is to be devoted to permanent sod, probably orchard grass. (Yield of 1931 crop of lespedeza and weeds to be recorded; improvement of area to be measured by subsequent yields.)

$P3_b$ relates to productivity renewal with kudzu on a steep, badly eroded semi-circular area in the east-central part of Field M, above earth dam. Kudzu to be planted in the collected silt and along slopes above. Records to be kept photographically.

$P3_c$ relates to the renewal of productivity, if possible, on absolutely sterile, deeply eroded clay (lower subsoil material), south of the Moore house.

This subproject to comprise two small adjoining plots to be enclosed by boards high enough to prevent any intake of outside water. The east plot, which supports not one sprig of vegetation of any kind, is to be treated with fertilizers, manures and whatever legumes or other crops that can be grown as a source of humus (no soil to be added). The west plot, which is equally sterile except that in the south-west corner there are 26 timy blackberry bushes, unproductive and none over 14 inches high, is to be improved, if possible, by whatever vegetation can be grown on it, as kudzu and some of the regional wild legumes, without addition of manure or fertilizers. Records to be kept by photographs and analysis of soil.

$P3_d$ relates to an attempt to control gullies and restore fertility on the severely gullied area north of the control plots ($P1_a$), where the gullies have cut down into the deep subsoil and into the C_1 horizon. In this project black locust, kudzu and pines are being utilized, together with brush fillings. Records to be kept photographically.

Project Four:

The purpose of this project is to determine the practical possibilities of slowing down erosion by growing soil-conserving crops, as small grain, sorghum, lespedeza etc., in strips, following the contours after the manner of terraces, between clean-tilled crops, the strips to be accurately surveyed out (probably with a fall of 2 inches in 100 feet). Subsequently, terraces may be built to supplement the soil-saving crops, depending on the effectiveness of the cropping system in controlling erosion.

$P4_a$ will comprise the small sloping area east of $P2_a$, extending south to the patch of permanent sod above $P3_b$ and east to the shadow of the woods. This plot to have a terrace above to carry water from slope above to the woods through the permanent sod immediately east of the control plots. Just below this terrace there is to be a 25-ft. strip of oats to be followed by sorghum and cowpeas thickly broadcasted. Below this will be cotton, which is to be followed by corn and cowpeas interplanted.

$P4_b$ is to be located west of the Coulter house (Field K): along upper slope next to woods is to be a 30-ft. lespedeza strip; below this a 60-ft. strip of cotton, and below the cotton, lespedeza on down to brink of steep, badly eroded slope. The upper lespedeza strip is to be worked into permanent grass. The lower slope, which has a grade of about 20 per cent, should be devoted to permanent sod. Probably in 1933 a terrace should be put in above the cotton, that is, in the upper strip of lespedeza. The present lespedeza to be made use of, but it will probably need some additional seed in February, 1932. If lespedeza does not establish a good sod by 1933, change to sorghum and cowpeas broadcasted, followed by Abruzzi rye and grass.

$P4_c$ will be in the Aldridge field north of Wahoo Branch; upper slope to be occupied by spring oats with lespedeza in a 35-ft. strip, with 50-ft. strip of corn below; then a strip of oats, with lespedeza, in a 35-ft. strip; with corn below. Additional seed to be put in lespedeza strips in 1933, if necessary.

$P4_d$ north of Moore house (Field H): lespedeza over crest of hill and down to stake on roadside; below this a 65-ft. strip of broadcasted sorghum and

cowpeas, this to be cut and wheat seeded in disced stubble, with lespedeza sown in February. Below this there is to be a 130-ft. strip of cotton and below this a 65-ft. strip of the present crop of lespedeza. Below the 65-ft. strip of lespedeza is to be a 140-ft. strip of cotton, and finally a 65-ft. strip of the present crop of lespedeza. (These widths were roughly stepped off and may need adjusting.) The present stand of lespedeza may need to be improved by additional seeding in February. Small gullies to be controlled with grass dams, using old fertilizer sacks containing soil and orchard grass seed.

It probably will be necessary to put terraces in the lespedeza strip following wheat in 1933 or 1934, and additional terraces may also be needed at other points in the field.

$P4_e$, below $P4_d$, to determine the effectiveness of strip cropping on gently sloping land. This subproject should be separated from the one above by a terrace: strip along upper side, 35 ft. wide, of the present crop of lespedeza, with 135 feet of corn below, and lespedeza below the corn. Shallow gullies to be controlled as in $P4_d$. On steep slope west of $P4_c$, which is obviously too steep for cultivation, permanent sod to be put in.

(The new ground west of the control plots, not yet cleared of stumps, would be a good place to install small areas of strip cropping for measuring runoff and erosion. This would be a good place also to include alfalfa in the stripping scheme.)

Project Five:

Purpose - to determine the practical possibilities of reducing erosion by soil modification, as by (1) skipping rows of clean-tilled crops, leaving a deep water-furrow to hold water in place of crop; (2) strip subsoiling; (3) breaking land in late summer when dry and leaving over winter in rough cloddy condition (or in spring or summer, and leaving rough until time for seeding to a winter-cover crop); and (4) the digging of holes in plowed ground with a machine, the holes being designed to retain part of the rainfall.

$P5_a$ to include a small plot, not yet selected, for growing two rows of cotton alternating with one row devoted to a deep water-furrow for retaining part of the rainfall. This experiment probably should include in one instance rows on the level, and in another, rows following contours with a fall of about one inch in a hundred feet. This subproject should be tried in 1932, if possible.

$P5_b$ to include experiments with leaving broken ground in rough cloddy condition over certain periods. It would be well to try this in a small way as soon as possible.

$P5_c$ to determine on a small plot the effectiveness of strip-subsoiling along contours (with slope of say 2 inches in a hundred). In this a strip of the width of two or three cotton rows would be subsoiled as deeply as possible (when the soil is somewhat dry), this strip to alternate with unsubsoiled strips of say about the same width as the subsoiled strips. This can not be done until a good subsoiling machine is available.

$P5_d$ to determine the effectiveness of digging holes in broken ground or behind cultivators, the holes to take up and hold as much rainfall as possible.

Project Six:

This study relates to the effect of erosion on the quality of crops (as well as on the yield).

P6 will deal with quantative measurements of (1) cotton staple length, tensile strength, color, etc., and (2) the protein and moisture contents of corn, wheat and possibly oats, where grown on (1) soil and (2) subsoil of the same original type, as on the normal and desurfaced plots of Pl_a. The cotton lint studies are to be made in the laboratories of the Division of Cotton Marketing, Bureau of Agricultural Economics, or by the N. C. Agricultural Experiment Station; the protein and moisture analyses are to be made (if practicable) by the N. C. Agricultural Experiment Station. Such investigations could also be carried further to study the effect of fertilizer, green manuring and rotation on the quality of crops.

Project Seven:

This study relates to the effect of terracing, rotations, incorporation of organic matter etc. on water storage in the soil (and subsoil).

P7 will deal with the determination, at stated intervals, of the moisture contained in the first, second, third and fourth foot sections of the soil profile (and deeper if necessary) of critical terraced areas, of the duplicate plots (Pl_a) etc. (Snyder should write S. V. Phillips or H. V. Geib of the Guthrie Erosion Station, Guthrie, Oklahoma, and of the Blackland Erosion Station, Temple, Texas, respectively, for details relating to sampling for these moisture studies.)

Project Eight:

This study relates to the general problem of erosion in the region of the Central Piedmont, its seriousness, extent, etc.

P8 will relate to the extent and degree of erosion (1) on the Erosion Farm (to be shown by surveys) and (2) in the general region. This would entail studies of erosion on different soil types occupying different slopes, including the measurement of runoff and erosion on outlying areas. These outlying studies to be begun after the Station plots are going nicely. The sampling will be done with dividers, now being perfected, which at low cost can be installed to take accurate aliquots of the runoff with its contained erosional debris. Rain gauges would of course accompany each installation of this nature.

The regional erosion studies would cover also observations and depth measurements pertaining to erosional overwash on alluvial plains (stream bottoms), estimates of the damage done etc.; and would deal also with the silting of streams, ditches and reservoirs.

Project Nine:

To study watershed on small creek crossing Highway 10 about 2 miles east of the Erosion Experiment Station, on north side of highway.

P9 will include a soil survey, erosion survey, map of cropped area, together with kinds of crops, vegetative survey (including character of organic ground cover), and history of agriculture. Samples of water will be taken of every rise of the stream and also a number of samples will be taken at the average height of flow in order to determine the normal silt load. The preliminary surveys to be made in winter. This would be a cooperative project with the engineers.

General Observation and Suggestions Relating to the Statesville Erosion Station

Item 1: If possible, Bartel to build a terrace to protect the conservation plots (Project Two, Field M), by running a terrace from upper side of $P2_a$ plots southeasterly to edge of woods. This would be purely a protection terrace, not designed for study. It should be put in as quickly as possible. Snyder has the details of what is desired.

Item 2: Bartel to advise what to do about old terraces on lower side of $P3_a$, i.e., whether it should be reconstructed, relocated or what.

Item 3: Grass dams (probably of orchard grass held in place by old fertilizer bags filled with woods soil and grass seed) should be placed at earliest favorable time in the shallow gullies in southeast corner of Field M.

Item 4: Permanent sod to be put on small plot of eroding land above $P3_b$, north of $P2_b$, east of $P2_a$ and south of $P3_c$.

Item 5: What appears to be a suitable site for forestry reclamation investigations is the area of very steep, badly eroded land on north side of first branch north of the Moore house. Much of this area has washed down to the infertile lower subsoil, even to the C horizon. It is entirely unsuitable for cultivation and it probably would be exceedingly difficult to establish any kind of sod on it. Other suitable areas for forestry work may be found on the east side of Alder Branch, southwest of the Moore house (and south of the lespedeza area west of Moore house). Part of these gullied and deeply eroded areas are now in the cattle pasture following Alder Branch. As they support very little pasturage, it would seem that they should be taken out of the pasture and reforested. These possible reforestation areas will be called to the attention of the State Foresters when they visit the Station for the purpose of locating suitable plots for this phase of the work, by Snyder and Bartel.

Item 6: A fairly good pasture area is that now being used for this purpose along Alder Branch from a point near the Moore house down to the Southern Railway tracks. This includes too much eroding steep land, as stated above, which should be eliminated; but the area could be increased somewhat by extending the fencing up the branch as far as there is any alluvial soil. In general, the fence line probably should be placed so as to take in all the alluvial soil on both sides of Alder Branch and, perhaps, some of the gentler lower slopes. On both sides of Alder Branch, immediately north of the Southern Railway, are two steep hillsides, now included in the pasture (carrying 4 cows and 1 bull, the property of men on the farm), which probably can be retained in the pasture especially if early spring grazing is avoided by them. These have some shallow gullies which should be treated with brush dams supplemented probably with honeysuckle. Probably other suitable pasture areas can be found elsewhere on

the farm. (All the severely eroded areas to be subjected to experimentation and reclamation should be photographed at the beginning of such work.)

Item 7: Dodder is widely distributed in some of the lespedeza fields and also on some of the $P2_a$ sweet clover plots. The proper procedure for handling this troublesome pest, introduced in the seed, is uncertain. Certainly, it would seem, the pest should be immediately eliminated from control plots and other small plots, as those of Project Two; but the matter of handling it in the fields is going to be difficult. It is highly desirable to keep the farm free of dodder if possible. Daily inspection and cleaning of the small plots with the idea of preventing a single seed from maturing on them will doubtless control the situation there.

Item 8: Thus far success with grasses has not been any too encouraging. Some good grass is badly needed for permanent sod, grass dams etc. Bermuda could be used, but the farmers of the region seem to be rather strongly opposed to this grass, and it may be best, on the Erosion Farm, not to go against such regional conceptions too strongly. This matter of getting a good sod of some good grass is deserving of very serious effort.

Note: The details of the engineering experiments are contained in a separate statement prepared by the Bureau of Agricultural Engineering.